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COMPARATIVE STUDY CONCERNING THE INFLUENCE OF DIFFERENT HERBICIDE TREATMENT IN ONION CULTURE

STUDIU COMPARATIV AL INFLUENŢEI DIFERITELOR TRATAMENTE DE ERBICIDARE ASUPRA CULTURII DE CEAPĂ

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ABSTRACT

A comparative study was performed concerning the action of three herbicides (Pantera 40 CE, Fusilade Super and Agil 100 EC) on onion culture. The Amstrong onion hybrid was used on clay - aluviovertic chernosem, with NPK fertilization ($N_{80}P_{80}K_{80}$) during the preparation of the germinative bed. The unfavorable climatic conditions influence the efficacy of the post-emergent applied herbicides, but significant differences were recorded between variants treated with different products. When Pantera 40 CE was used, phytotoxicity phenomena materialized by temporary discoloration of the plants were not recorded, compared to the results obtained when the other herbicides were used. The use of Pantera 40 CE led to the most important production gain, with 9.8% compared to Fusilade super and 4.8% with Agil 100 EC.

KEY WORDS: herbicide, onion culture, efficacy, Pantera 40 CE, Agil 100 EC, Fusilade super

REZUMAT

Testarea comparativa a actiunii a trei erbicide (Pantera 40 CE, Fusilade Super si Agil 100 EC) asupra culturii cepei a constituit obiectul prezentului studiu. A fost utilizat hibridul de ceapa Amstrong, iar solul a fost reprezentat de cernoziom argilos aluviovertic. Pe parcursul pregatirii patului germinativ s-a practicat o fertilizare NPK ($N_{80}P_{80}K_{80}$). Conditiile climatice nefavorabile au influentat eficienta erbicidelor aplicate postemergent, manifestandu-se diferente semnificative intre variantele experimentale in care s-au efectuat tratamente cu diverse produse. Spre deosebire de rezultatele obtinute ca urmare a aplicarii celorlate doua erbicide, in cazul utilizarii erbicidului Pantera 40 CE nu s-a inregistrat manifestarea fenomenului de fitotoxicitate, materializat prin decolorarea temporara a plantelor. Administrarea erbicidului Pantera 40 CE a condus la obtinerea celei mai mari productii de ceapa la hectar, superioara cu 9.8% celei obtinute in cazul utilizarii ebicidului Fusilade super si cu 4.8% fata de cea obtinuta cand s-a utilizat Agil 100 EC.

CUVINTE CHEIE: erbicid, cultura cepei, eficienta, Pantera 40 CE, Agil 100 EC, Fusilade super

DETAILED ABSTRACT

Ceapa este una dintre cele mai rentabile specii de leguminoase, daca la cultura acesteia sunt aplicate tehnologii moderne ce includ utilizarea erbicidelor adecvate. Experimentul a fost realizat in perioada 06.04.2007 - 02.10.2007 in campul experimental de la ferma Cojocna a Universitatii de Stiinte Agricole si Medicina Veterinara Cluj - Napoca. A fost utilizat hibridul de ceapa Amstrong F1. In cadrul acestuia a fost testate eficienta a trei erbicide gramicide: Agil 100 EC – 1 Kg/Ha, Fusilade Super 1 Kg/Ha si Pantera 40 CE - 2 Kg/Ha. Tratamentele au fost aplicate postemergent (08.06.2007). A fost inregistrat gradul de combatere a buruienilor pe parcursul perioadei de vegetatie, la 14 si respectiv la 28 de zile de la aplicarea tratamentelor. Pe parcursul ambelor perioade de observatie, cele mai mari punctaje EWRS au fost inregistrate in cazul tratamentelor efectuate cu erbicidului Pantera 40 CE (2,5 la 14 zile de la aplicarea tratamentului si respectiv 3,0 la 28 de zile de la aplicarea tratamentului), urmate de cele obtinute cand s-a aplicat erbicidul Agil 100 EC (2,0 si respectiv 2,5), iar cele mai mici in cazul aplicarii erbicidul Fusilade super (1,0 si respectiv 1,5). Eficienta erbicidelor utilizate pentru combaterea buruienilor cepei inainte de recoltare este exprimata atat cantitativ, respectiv buruieni eradicate, cat si sub forma de procent de combatere, insa criteiul final de estimare a eficientei erbicidelor a fost cel al productiei de bulbi de ceapa obtinuti in urma aplicari tratamentului. In comparatie cu productia de bulbi de ceapa obtinuta in cazul aplicarii erbicidului Fusilade super (23.100 t/parcela experimentala), productia obtinuta in cazul aplicarii celorlalte doua a fost de 23.980 t/parcela experimentala (Agil 100 EC) si 25.370 t/parcela experimentala (Pantera 40 CE), superioara cu 1.390 kg/Ha si respectiv 2.270 Kg/Ha. Conditiile climatice nefavorabile au influentat eficienta erbicidelor postemergente, inregistrandu-se diferente semnificative intre variantele tratate cu diferite produse. Administrarea erbicidului Pantera 40 CE a condus la obtinerea celei mai mari productii de ceapa la hectar, superioara cu 9.8% celei obtinute in cazul utilizarii ebicidului Fusilade super si cu 4.8% fata de cea obtinuta cand s-a utilizat Agil 100 EC.

1 Ha	1 Ha	1 Ha
Agil 100 EC	**Fusilade Super**	**Pantera 40 CE**

Fig.1. The experimental scheme
Fig. 1. Schema experimentală

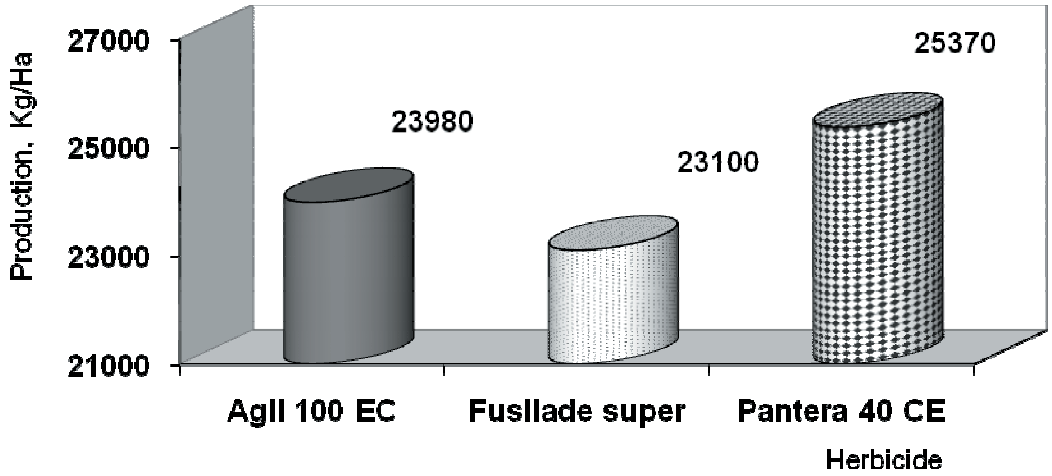

Fig 2. The diagram of onion production obtained after herbicide treatment
Fig 2. Diagrama producției de ceapă obținută în urma aplicării erbicidelor

INTRODUCTION

The onion, biennial or triennial specie, which belongs to bulb vegetables group, is one of the most rentable vegetable specie, if modern culture technologies involving suitable herbicides are used [7].

Being sensitive to climatic conditions, which can create conditions for big amount of weeds, that determine certain yield reduction owing to slow emergence, low initial growth rate, long vegetative period and low competitive ability, the onion culture must be suitable managed in order to obtain the expected production [5]. For this reason, onion requires absolute early weed control, by different means [6, 7].

Lots of onion weed fighting methods were tested in time, e.g. thermal weed control with flaming [1], mechanical in-row cultivation in row crops [2, 4], thermal weed control by water steam [8], finger weeders [3]. These methods are not enough efficient to provide good production, when climatic adverse conditions are present and big weeds amounts are present. Weed suppression is one of several benefits achieved by using suitable herbicides in their control. Ourdays, the chemical weed control is largely widespread in onion culture management and generally involves the use of post-emergence treatments even if some can cause a temporary phytotoxicity.

MATERIAL AND MEHOD

The field trial was performed during 06.04.2007 - 02.10.2007 in the experimentally field from the Cojocna farm of the University of Agricultural Sciences and Veterinary Medicine Cluj - Napoca.

The Amstrong onion (Allium cepa, fam. Liliaceae) hybrid was used. It is created by Bejo Zaden BV Company, Holland [10]. It is a hybrid with vegetation period of 95 – 101 days, and very productive, over 45 tonnes/Ha.

Table 1 The experimental variants
Tabelul 1 Variantele experimentale

No. crt.	Herbicide Erbicidul	Dose Doza Kg/Ha	Treatment time Epoca de tratament
1	Agil 100 EC	1.0	post-emergent
2	Fusilade Super	1.0	post-emergent
3	Pantera 40 CE	2.0	post-emergent

Table 2 The selectivity of herbicides used for the fight against weeds in onion culture evaluated according to EWRS* scale
Tabelul 2 Selectivitatea erbicidelor în experienţe privind combaterea buruienilor din cultura de ceapă, evaluată după scara EWRS

No. crt.	Herbicide Erbicidul	Dose Doza Kg/Ha	At 7 days	At 14 days	At 28 days
1	Agil 100 EC	1.0	1	1	1
2	Fusilade Super	1.0	1	1	1
3	Pantera 40 CE	2.0	1	1	1

* European Weed Research Society

Table 3 The degree of fight against weeds estimated during vegetation period from the treatment (14 days)

No. crt.	Herbicide Erbicidul	Dose Doza Kg/Ha	EWRS Score Punctaj EWRS	% of fight % de combatere	Not eradicated weed species Specii de buruieni neeradicate
1	Agil 100 EC	1.0	2.0	90	CONAR*, HIBTR**, ECHCG***
2	Fusilade Super	1.0	1.0	97	CONAR*, HIBTR**
3	Pantera 40 CE	2.0	2.5	86	CONAR*, HIBTR**, ECHCG

* *Echinochloa crus-galli var. frumentacea (Roxb.) W. F. Wight* (Japanese millet, fam.Poaceae), Bayer Code – ECHCG
** *Convolvulus arvensis L.* (Bindweed, Field; fam. Convolvulaceae), Bayer Code – CONAR
*** *Hibiscus trionum L.* (Mallow, Venice; fam. Malvaceae), Bayer Code – HIBTR

Table 4 The degree of fight against weeds estimated during vegetation period from the treatment (28 days)

No. crt.	Herbicide Erbicidul	Dose Doza Kg/Ha	EWRS Score Punctaj EWRS	% of fight % de combatere	Not eradicated weed species Specii de buruieni neeradicate
1	Agil 100 EC	1.0	2.5	84	CONAR*, HIBTR**, ECHCG***
2	Fusilade Super	1.0	1.5	96	CONAR*, HIBTR**
3	Pantera 40 CE	2.0	3.0	80	CONAR*, HIBTR**, ECHCG

* *Echinochloa crus-galli var. frumentacea (Roxb.) W. F. Wight* (Japanese millet, fam.Poaceae), Bayer Code – ECHCG
** *Convolvulus arvensis L.* (Bindweed, Field; fam. Convolvulaceae), Bayer Code – CONAR
*** *Hibiscus trionum L.* (Mallow, Venice; fam. Malvaceae), Bayer Code – HIBTR

Table 5 The efficacy of the herbicides used in fight against onion weeds before harvesting
Table 5 Eficacitatea erbicidelor în combaterea buruienilor la ceapă înainte de recoltare

No. crt.	Herbicide Erbicidul	Dose Doza Kg/Ha	Gravimetric q/ha						% of fight				
			Total		Dicotyl.		Monocotyl.		Total	Dicotyl.		Monocotyl	
			q/ha	%	An.	Per.	An.	per.		An.	Per	An.	Per
1	Agil 100 EC	1.0	4.6	10.8	-	0.5	4.0	-	89	-	-	90	-
2	Fusilade Super	1.0	1.3	3.1	0.6	0.4	0.4	-	96	-	-	99	-
3	Pantera 40 CE	2.0	4.8	11.3	-	-	4.7	-	88	-	-	89	-

Table 6 The effect of the herbicides on the onion bulb production
Table 6 Efectul erbicidelor asupra producției de bulbi de ceapă

No. crt.	Herbicide Erbicidul	Dose Doza Kg/Ha	Treatment time Epoca de tratament	Production Producția	
				Kg /Ha	%
1	Agil 100 EC	1.0	post-emergent	23,980	3.8
2	Fusilade Super	1.0	post-emergent	23,100	0
3	Pantera 40 CE	2.0	post-emergent	25,370	9.8

The culture was perfomed on clay - aluviovertic chernosem, with 3.12 – 2.14% humus, 51.18 – 55.50% clay content, and pH = 7.5 - 7.6. The autumn wheat was the pre-emergent plant. NPK fertilization ($N_{80}P_{80}K_{80}$) during the preparation of the germinative bed was administered. During the onion vegetation period (April – September) 659.40 mm precipitations were recorded, with 340.70 mm more than normal for this period in Romanian climatic conditions for Transylvanian region.

The action of three gramicid herbicides was tested on onion culture. They were: Agil 100 EC (propaquizafop) used in fight against monocotyledonatae and perennial weeds, Fusilade Super (fluazifop-p-butil) against annual and perennial mono- and dicotyledonatae weeds and Pantera 40 CE (quisalofop-p-tefuril), a total, not selective systemic herbicide. The administered doses were: Agil 100 - 1 Kg/Ha, Fusilade Super – 1 Kg/Ha, and Pantera 40 CE - 2 Kg/Ha. The treatments were post-emergent (08.06.2007). Three plots cultivated with onion, 1Ha each, were used for determination of herbicides efficiency (fig. 1).

RESULTS AND DISCUSSIONS

The weed population in the experiment was consisted of monocotyledonatae and dicotyledonatae, the most prevaling being: Matricaria chamomilla, Agropyron repens, Capsella bursa pastoris, Cirsium arvense, Amaranthus retroflexus, Echinochloa crus-galli var. Frumentacea, Convolvulus arvensis L., Hibiscus trionum L. [10].

According to experimental variants, the herbicide treatment was pre-emergently performed (table 1) and selectivity of the products used for the fight against weeds in onion culture was evaluated according to European Weed Research Society (table 2).

The degree of fight against weeds was recorded during vegetation period at 14 days (table 3) and 28 days (table 4), respectively, from the treatment. During both observations, the highest EWRS score was obtained

for Pantera 40 CE treatments (2.5 at 14 days from the treatment and 3.0 at 28 days after treatment, respectively), followed by Agil 100 EC treatments (with 2.0, and 2.5, respectively) and the lowest score for Fusilade super treatments (1.0, and 1.5, respectively).

Concerning the eradicated weed species, only two (Convolvulus arvensis L., and Hibiscus trionum L.) survived when Fusilade super (1 kg/Ha) was used. When Agil 100 EC and Pantera 40 CE were administered, three weed species were not eradicated, Echinochloa crus-galli var. Frumentacea, Convolvulus arvensis L., and Hibiscus trionum L., namely.

The efficacy of the herbicides used in fight against onion weeds before harvesting is presented both as quantity of eradicated weeds and % of fight (table 5), but the final criterion for herbicide efficacy was taken as the onion bulb production after treatment (fig. 2, table 6). Compared to onion bulb production when Fusilade super was administered (23,100 tonnes/experimental plot), the production obtained when the other two herbicides were used was of 23,980 tonnes/experimental plot (Agil 100 EC) and 25,370 tonnes/experimental plot (Pantera 40 CE), with 1,390 kg/Ha (4.8%) and 2.270 Kg/Ha (9.8%) respectively.

Due to hard winter, high humidity and low temperatures, the seeding was performed with 3 weeks later. This led to a longer vegetation period and development of weed species, consequently. The climatic conditions recorded during 2007 influenced the efficacy of the post-emergent herbicide, diminishing their efficiency, due to the intensification of the metabolic processes and dilution of the cellular liquid.

Using as seeding material an onion hybrid, which exhibited the heterosis effect, the productions were qualitatively superior even the unfavourable conditions manifested within the experimental year.

When Pantera 40 CE was used, phytotoxicity phenomena materialized by temporary discoloration of the plants were not recorded, compared to the results obtained when the other herbicides were used.

CONCLUSIONS

The unfavorable climatic conditions influence the efficacy of the pre-emergent applied herbicides, but significant differences were recorded between variants treated with different products. When Pantera 40 CE was used, phytotoxicity phenomena materialized by temporary discoloration of the plants were not recorded, compared to the results obtained when the other herbicides were used. The use of Pantera 40 CE led to the most important production gain, with 9.8% compared to Fusilade super and 4.8% with Agil 100 EC.

BIBLIOGRAPHY

[1] Ascard J. Thermal weed control with flaming in onions. 30th Swedish Crop Protection Conference, Uppsala. Weeds and weed control, (1989) Vol.2, 35-50.

[2] Ascard J., Bellinder RR. Mechanical in-row cultivation in row crops. In: Proceedings Second International Weed Control Congress, Copenhagen, (1996) 1121-1126.

[3] Bleeker P.O., and R. van der Weide. Possibilities of finger weeders, 3rd EWRS Workshop on Physical Weed Control, (1998) 16

[4] Bleeker P.O., D.A. van der Schans & R.Y. van der Weide. Different strategies to improve mechanical intra-row weed control in bulb onions, Proceedings 6th EWRS Workshop on Physical and Cultural Weed Control Lillehammer, Norway, (2004) 97 – 100

[5] Dobrzanski A., Palczynski J, Anyszka Z, Adamicki F. The influence of post-emergence weed control programmes on yield and storage quality of onion. 9th EWRS Symposium " Challanges for Weed Science in Changing Europe", (1995) 351-355.

[6] H. Mennan, D. Işik, 2003, Invasive weed species in onion production systems during the last 25 years in Amasya, Turkey , Pak. J. Bot., 35(2): 155-160

[7] Roberts H.A. Weed and the onion crop. J. Royal Hort. Sci. (1973) 98: 230-235.

[8] Sirvydas A., P.Lazauskas, R.Vasinauskienė, A. Stepanas & P.Kerpauskas. Thermal weed control by water steam in bulb onions, Proceedings 6th EWRS Workshop on Physical and Cultural Weed Control Lillehammer, Norway, (2004) 170 – 173

[9] http://www.thundersnow.com/pdfdocs/weedlistv3sci.pdf

[10] http://www.elsoms.com/PDFs/23-26.pdf